



[4910-13-P]

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 39**

**[Docket No. FAA-2009-1100; Directorate Identifier 2009-NE-37-AD; Amendment 39-18159; AD 2015-10-04]**

**RIN 2120-AA64**

**Airworthiness Directives; International Aero Engines AG Turbofan Engines**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final rule.

**SUMMARY:** We are superseding Airworthiness Directive (AD) 2012-09-09 for all International Aero Engines AG (IAE) V2500-A1, V2525-D5, and V2528-D5 turbofan engines, and certain serial numbers (S/Ns) of IAE V2522-A5, V2524-A5, V2527-A5, V2527E-A5, V2527M-A5, V2530-A5, and V2533-A5 turbofan engines. AD 2012-09-09 required cleaning, eddy current inspection (ECI) or fluorescent penetrant inspection (FPI), and initial and repetitive ultrasonic inspections (USIs) of certain high-pressure compressor (HPC) stage 3 to 8 drums, as well as replacement of the drum attachment nuts. This new AD expands the affected population for initial and repetitive USIs of the HPC stage 3 to 8 drum, revises the inspection intervals, requires performing ECI or FPI, requires removal of the affected attachment nuts and any HPC stage 3 to 8 drum found cracked, and adds a mandatory terminating action. This AD was prompted by the discovery that additional attachment nuts for certain HPC stage 3 to 8 drums are affected. We are issuing this AD to prevent failure of the HPC stage 3 to 8 drum, which could result in uncontained drum failure, damage to the engine, and damage to the airplane.

**DATES:** This AD is effective [INSERT DATE 35 DAYS AFTER DATE OF

PUBLICATION IN THE FEDERAL REGISTER].

The Director of the Federal Register approved the incorporation by reference of a certain publication listed in this AD as of [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**ADDRESSES:** For service information identified in this AD, contact International Aero Engines AG, 400 Main Street, East Hartford, CT 06118; phone: 860-368-3700; fax: 860-368-4600; email: [iaeinfo@iae2500.com](mailto:iaeinfo@iae2500.com); Internet: <https://www.iaeworld.com>. You may view this service information at the FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA. For information on the availability of this material at the FAA, call 781-238-7125. It is also available on the Internet at <http://www.regulations.gov> by searching for and locating Docket No. FAA-2009-1100

#### **Examining the AD Docket**

You may examine the AD docket on the Internet at <http://www.regulations.gov> by searching for and locating Docket No. FAA-2009-1100; or in person at the Docket Management Facility between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this AD, the regulatory evaluation, any comments received, and other information. The address for the Docket Office (phone: 800-647-5527) is Document Management Facility, U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE., Washington, DC 20590.

**FOR FURTHER INFORMATION CONTACT:** Martin Adler, Aerospace Engineer, Engine Certification Office, FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803; phone: 781-238-7157; fax: 781-238-7199; email: [martin.adler@faa.gov](mailto:martin.adler@faa.gov).

## **SUPPLEMENTARY INFORMATION:**

### **Discussion**

We issued a notice of proposed rulemaking (NPRM) to amend 14 CFR part 39 to supersede AD 2012-09-09, Amendment 39-17044 (77 FR 30371, May 23, 2012), (“AD 2012-09-09”). AD 2012-09-09 applied to all IAE V2500-A1, V2525-D5, and V2528-D5 turbofan engines, and certain S/Ns of IAE V2522-A5, V2524-A5, V2527-A5, V2527E-A5, V2527M-A5, V2530-A5, and V2533-A5 turbofan engines. The NPRM published in the Federal Register on December 24, 2014 (79 FR 77411). The NPRM was prompted by the discovery that partially silver-plated nuts for certain HPC stage 3 to 8 drums cause the drum to corrode and crack. The NPRM proposed to perform ECI or FPI, and initial and repetitive USIs of certain HPC stage 3 to 8 drums. The NPRM also proposed to expand the affected population for initial and repetitive USIs of the HPC stage 3 to 8 drum, revise the inspection intervals, require removal of the affected attachment nuts and any HPC stage 3 to 8 drum found cracked, and add a mandatory terminating action. We are issuing this AD to prevent failure of the HPC stage 3 to 8 drum, which could result in uncontained drum failure, damage to the engine, and damage to the airplane.

### **Comments**

We gave the public the opportunity to participate in developing this AD. The following presents the comments received on the NPRM (79 FR 77411, December 24, 2014) and the FAA’s response to each comment.

### **Request to Change Compliance Paragraph**

One commenter requested that paragraph (f)(3) of the NPRM (79 FR 77411, December 24, 2014) be changed from “If you inspect the HPC stage 3-8 drum at shop visit...” to “If you have previously inspected the HPC stage 3-8 drum at piece-part exposure as shown in the Grace Periods Table for each compliance group listed in paragraph 1.E. in IAE Alert Non-Modification Service Bulletin (NMSB) No. V2500-

ENG-72-A0615, Revision 6, dated September 4, 2014.” The justification for this comment is that the AD wording is not clear enough for the actual work performed.

We partially agree. We agree with referring to piece-part exposure instead of shop visit. We disagree with referencing the service bulletin (SB) because the AD wording is otherwise clear in its reference to the Grace Periods Table for each compliance group. We changed paragraph (f)(3) of this final rule by changing “at shop visit” to “at piece-part exposure.”

#### **Request for Paragraph Clarification**

The same commenter suggested adding engine manual (EM) Task No. or SB reference to paragraphs (g)(2), (g)(3)(i), and (g)(3)(ii) because these paragraphs do not provide the specific method to perform the stated requirements.

We do not agree. The SB and EM tasks for these operations are not mandated. Therefore, they are referenced in the Related Information section of the AD. We did not change the AD.

#### **Request to Clarify Terminating Action**

Lufthansa, United Airlines (UA), and another commenter, asked that the AD be clarified that if the terminating actions were performed prior to the effective date of the AD, credit may be taken and no further action would be required. The commenter’s justification is that the AD should be clear that if the parts are installed prior to effective date of the AD, the parts installation should be considered as terminating action.

We do not agree because paragraph (e), Compliance, states to perform the requirements of the AD “unless already done.” This statement applies to all requirements of the AD including the terminating action. No additional clarification is needed. We did not change the AD.

### **Request to Change Compliance Time**

An anonymous commenter requested that repetitive inspections not start until after the threshold for the initial inspection has been reached. The justification for this request is that many unnecessary extra inspections would have to be performed if the initial inspection is performed early, and the AD requires repeat inspections to follow immediately.

We agree. This final rule was changed as follows: paragraphs (f)(1) and (f)(2) were changed from "...of the last USI." to "...of the last USI after the initial inspection required by paragraph (e) of this AD."

### **Agreement with Proposed AD**

The Boeing Company agreed with the NPRM (79 FR 77411, December 24, 2014) as written.

### **Request Change to Costs of Compliance**

Lufthansa and Wizz Air stated that the terminating action will result in many unplanned extra shop visits to remove parts. The cost analysis does not include the cost associated with these extra shop visits.

We do not agree. The Costs of Compliance in the AD includes prorated part costs based on early removal of parts. Our cost calculations do not include costs associated with engine removal, down time, or scheduling. We did not change the AD.

### **Request to Include Revision and Date Information for Service Information**

Lufthansa and IAE requested that service information include revision and date information. They suggested that the service information does not list the latest revision information or, in some cases, any revision information at all.

We partially agree. We agree that the SB references should reflect the latest revision. We disagree with adding the revision and/or date to all instances of SBs referenced in the Related Information paragraph because the revision date is listed on the

first instance of each SB referenced in the paragraph. We changed the Related Information paragraph by changing the date of IAE NMSB No. V2500-ENG-72-0625 to October 8, 2014.

#### **Request to Change Applicability**

Lufthansa stated that the compliance categories (applicability) are based on engine serial number. The commenter suggested defining the categories based on drum serial number rather than engine serial number because the inspection times and intervals should be based on the drum history. The correct inspection times and intervals may not be utilized for the affected drums if a drum moves from one engine to another.

We do not agree. We evaluated use of drum serial numbers versus engine serial numbers and chose engine serial numbers based on the increased complexity associated with tracking drum serial numbers. It was also noted that it is more likely that an engine, as opposed to an individual used drum, would be moved. The engine groups in the AD reflect the unsafe condition as it exists today. If the engine distributions change significantly in the future, we would consider additional rulemaking. We did not change the AD.

#### **Request to Change Service Information**

Rolls Royce plc proposed that revision 6 of IAE Alert NMSB No. V2500-ENG-72-0615 be quoted in the AD, and that all references to it, including engine groups affected, be aligned to this latest revision. The justification for this request is that the current AD references IAE NMSB No. V2500-ENG-72-0615, Revision 3. This NMSB is now at revision 6.

We do not agree because the AD already references Revision 6 of IAE Alert NMSB No. V2500-ENG-72-A0615. We did not change the AD.

### **Request Clarification of Material Incorporated by Reference**

UA and Delta Airlines requested clarification of whether IAE NMSB No. V2500-ENG-72-0638 is considered incorporated by reference. This AD will incorporate by reference IAE Alert NMSB No. V2500-ENG 72-0615, Revision 6, dated September 4, 2014, which refers to IAE NMSB No. V2500-ENG-72-0638 for instructions on performing the USI. IAE NMSB No. V2500-ENG-72-0638 contains instructions and procedures that do not affect failure mode detection, prevention or elimination of the unsafe condition identified in the NPRM (79 FR 77411, December 24, 2014) and should not be mandated by the AD.

We agree that IAE Alert NMSB No. V2500-ENG-72-0638 should not be incorporated by reference. We changed the AD to remove the requirement to use IAE NMSB No. V2500-ENG-72-0638. We also added a new paragraph (g) to this AD that provides specific information from IAE NMSB No. V2500-ENG-72-0638 to perform the USI.

### **Request Change to Relevant Service Information**

UA and Delta Airlines requested that IAE NMSB No. V2500-ENG-72-0638 be added to the Relevant Service Information paragraph.

We partially agree. We do not agree with adding IAE NMSB No. V2500-ENG-72-0638 to the Relevant Service Information paragraph because that paragraph is not in the final rule. We agree that the service information should be included in the AD, elsewhere. We added IAE NMSB No. V2500-ENG-72-0638 to the Related Information paragraph.

### **Request Clarification of Compliance Time**

UA and LATAM Airlines requested clarification on the difference between the AD and SB terminating actions for compliance time to incorporate terminating action. The AD requires accomplishment within 9,450 cycles after the effective date of the AD,

while the SB requires accomplishment by December 31, 2021. The commenter said shop visits were planned based on the end date in the SB. The AD limit of 9,450 cycles will force engines off wing earlier than planned.

We do not agree. The cycle limit in the AD represents fleet average utilization up to the SB 'accomplish by' date. We did not change the AD.

#### **Request Clarification for Terminating Action**

UA requested clarification that inspections are not required after the terminating action has been performed. UA suggested that this clarification was required because the SB Grace Periods Tables include timing for any drum fitted with non-silver nuts. It is not explicit that the table does not apply to a new drum with non-silver nuts.

We do not agree. Terminating action means that no further action is required. Therefore, the AD does not require any additional inspections after the terminating action has been accomplished. We did not change the AD.

#### **Request Deletion of Service Information**

UA identified that IAE NMSB No. V2500-ENG-72-0638, Part B paragraph (3)Y.(3) states that an engine be rejected if staining and/or cracking of the ceramic liner is found. This requirement should not be mandated because this concern was addressed in AD 2012-09-09 which was superseded. The FAA agreed that there was not clear acceptance criteria to mandate engine rejection based on staining and axial cracking of the HPC stage 7 to 8 drum ceramic liner.

We agree. We changed this final rule by deleting reference to IAE NMSB No. V2500-ENG-72-0638 in paragraph (e) of this AD.

#### **Request to Include a Ferry Flight**

UA requested that the AD be changed to allow a one-cycle ferry flight. No justification was given.

We do not agree. Per 14 CFR 39.23, an AD only addresses ferry flights if they are prohibited. We did not prohibit ferry flights in this AD. We did not change the AD.

#### **Request Clarification of Compliance Time**

UA commented that some grace periods in AD 2012-09-09 are different from the NPRM (79 FR 77411, December 24, 2014). UA requested clarification that the older compliance times in AD 2012-09-09 are no longer applicable or available and let “Credit for Previous Actions” allow the longer compliance times of the NPRM. The clarification was requested since, for compliance intervals that have been shortened, the commenter can see no way to address those engines, particularly if the engine has already exceeded the shortened interval. For intervals that have been extended, inspection intervals can easily be extended to agree.

We do not agree. AD 2012-09-09 is being superseded by this AD; therefore, the previous compliance times are inapplicable after the effective date of this AD. This final rule allows 200 cycles after the effective date of the AD to perform the initial USI if the cycles since new threshold has been passed. If the cyclic interval allowed by this AD for the next USI based on the last part inspection has been surpassed, then the initial inspection requirements would apply. This means you must inspect within 200 cycles after the effective date of this AD. We did not change the AD.

#### **Request to Change Service Information**

UA stated that the USI procedures, as defined in IAE NMSB No. V2500-ENG-72-0638, which lift the probe off the surface of the drum, should not be mandated. The USI procedures, in IAE NMSB No. V2500-ENG-72-0638, use a “clamp” added to the USI probe to lift the probe off of the drum. This procedure relies on couplant to fill the gaps to the drum and any missing drum coatings. UA is not confident that accurate measurements can be consistently achieved using this procedure, especially in areas that have been repaired.

We partially agree. We agree that the USI procedures in IAE NMSB No. V2500-ENG-72-0638, and those referenced in superseded AD 2012-09-09, are valid methods of inspection. We disagree that the procedure in IAE NMSB No. V2500-ENG-72-0638 would not provide accurate measurements. We changed this AD by removing IAE NMSB No. V2500-ENG-72-0638 and adding a paragraph that provides specific information to perform the USI.

#### **Request to Change Service Information**

Jetstar Group Airways requested that allowance for future SB revisions be included in the AD.

We do not agree. We cannot mandate documents which do not yet exist. We did not change the AD.

#### **Request to Change the Applicability**

Jetstar Group Airways requested that the applicability for V2500-A5 engines be revised to exclude Engine Serial Number (ESN) V16660 and higher as the introduction of the terminating action configuration began with ESN V16660 based on the applicability of IAE SB V2500-ENG-72-0632 that introduced silver free nuts.

We do not agree. The AD applicability is correct. The applicability defined in IAE SB V2500-ENG-72-0632 does not reflect actual part installations. We did not change the AD.

#### **Request to Allow Repetitive Inspections**

Lufthansa, Jetstar Group Airways, Wizz Air, and MTU Maintenance (MTU) requested to remove “within 9,450 cycles after the effective date of the AD” for terminating action and allow unlimited USI. The commenters pointed out that the unsafe condition results from a corrosive operating environment, and the amount of corrosion varies with time and location. The commenters also pointed to the lack of data to support a calendar end date of 2021, and that the hard time for part removals will drive younger

parts off wing early, with no additional benefits to safety. Finally, the commenters offered that if the USI and the ECI provide sufficient safety against an uncontained failure, this should also be the case after 9,450 flight cycles (FC). Additionally, the overall risk in the fleet will decrease due to the number of planned shop visits.

We do not agree. The ongoing repetitive inspections do not provide sufficient safety by themselves and are considered interim actions. The previous ADs did not include an end date because no terminating action was available. This AD includes mandatory terminating action that completely removes the noted unsafe condition and restores an acceptable level of safety. We did not change the AD.

#### **Request to Change Terminating Action**

Wizz Air, Lufthansa, and Delta Airlines requested the compliance time for terminating action be changed from “9,450 FC after the effective date of the AD” to “at next piece-part exposure.” This will eliminate extra shop visits solely for drum replacement.

We do not agree. This change would significantly increase the need for spare parts in the near term, which cannot be supported by industry at this time. We did not change the AD.

#### **Request to Change Compliance**

IAE requested that the Compliance phrase “If cracks are found...” be changed to “if crack indications or inspection rejections are found...”. The reason for this request is that FPI, USI, and ECI only indicate a crack may be present. Cracks typically can only be confirmed via lab destructive testing.

We do not agree. If a part fails the inspection it is assumed to be cracked. No additional testing is requested or required to prove a crack exists. We did not change the AD.

### **Request to Change Compliance**

IAE and MTU requested that “cycles since new” (CSN) refer to cycles on the specific drum and not engine cycles since new. If drums are replaced, there could be confusion on when a part must be inspected.

We agree. We changed paragraphs (e)(1) through (e)(5) from “within 200 cycles of accumulating xxxx CSN” to “within 200 cycles of the drum accumulating xxxx cycles.”

### **Request to Change Compliance Time**

IAE and MTU requested an end date of December 31, 2025 be added to the compliance time in addition to the existing cycle limit. This request was justified because low utilization operators will not be required to upgrade their engines until well beyond 2040 with only the cycle limit. IAE is concerned that after the larger operators have completed the upgrades to their fleets, the expertise and equipment required to perform the required inspections will no longer be available.

We agree. We changed the Mandatory Terminating Action paragraph to include an end date of December 31, 2025.

### **Request Change to Credit for Previous Actions Paragraph**

IAE requested that IAE NMSBs No. V2500-ENG-72-0594, No. V2500-ENG-72-0603, No. V2500-ENG-72-0608, Revision 2 and earlier, and No. V2500-ENG-72-0615, Revision 2 and earlier, be removed from the “Credit for Previous Actions” paragraph because these SB revisions do not require complete inspection of the drum circumference in areas of liner loss. Incomplete inspections are not effective at detecting cracks and compromises safety.

We agree. We removed IAE NMSB No. V2500-ENG-72-0594, IAE NMSB No. V2500-ENG-72-0603, IAE NMSB No. V2500-ENG-72-0608, Revision 2 and earlier,

and IAE NMSB No.V2500-ENG-72-A0615, Revision 2 and earlier, from the Credit for Previous Actions paragraph.

### **Request to Simplify Compliance**

Delta Airlines commented that the compliance plan as proposed in the NPRM (79 FR 77411, December 24, 2014), is too complicated. Delta said that it requires: (1) knowledge of where the HPC 3-8 drum(s) have operated by flight number for the V2500-A1 and V2500-A5 engine models; (2) tracking the inspections performed at shop level for the HPC 3-8 drum(s); (3) tracking the HPC module assembly for the 3-8 drum(s) installed and the configuration at the last shop visit of the HPC module; and (4) operators to trace documents of HPC 3-8 drum(s) that exchanged between HPC modules and from other operators. Without those trace documents, operators will be forced to obtain new HPC 3-8 drum(s) to prevent recontamination of their respective fleets.

We do not agree. The changes we proposed in this AD, expanding the population, changing the inspection interval, etc., are not complex changes to the compliance program. We also evaluated the original compliance program requirements. We did not conclude that they were so complex that operators would find them difficult to understand, particularly since the information needed to comply with the AD is available in operator records. We did not change the AD.

### **Request Clarification of Service Information**

Delta Airlines stated that IAE Alert NMSB No.V2500-ENG-72-A0615, Revision 6, has lists of engine models and drum part numbers. The SB lists drum part numbers as associated with the V2500-D5 engine that are not approved for installation on the V2500-D5 engine. The SB could be misinterpreted as allowing use of part numbers on the V2500-D5 engine model that have not actually been approved for use.

We do not agree. The SB separates engine applicability into six groups. The drum part numbers listed for each group represent the possible drum part numbers for all the

noted engine models listed in the group. These groupings do not otherwise indicate that part numbers are interchangeable among the engine models. The groups that include V2500-D5 (Group E and group F) also include other engine models. We did not change the AD.

#### **Request Clarification of Mandatory Terminating Action Paragraph**

Lufthansa requested clarification of the Mandatory Terminating Action paragraph. The commenter stated that the paragraph directing the installation of HPC stage 3 to 8 drum is not clear if the mandatory terminating action is meant to be a hard-time limit which requires removal of drums from service by means of a shop visit. The commenter suggested that the terminating action for drum replacement may be substituted by an on-wing USI. On-wing USI could occur after 9,450 FC from the effective date of this AD until the engine has a shop visit.

We do not agree. The mandatory terminating action has a hard-time limit of 9,450 FC after the effective date of this AD. The terminating actions must be performed within this time. The AD does not give allowance to perform inspections in place of performing the terminating actions. We did not change the AD.

#### **Request to Revise Mandatory Terminating Action**

MTU requested that the mandatory terminating action be delayed based on the appropriate inspection grace period listed in the service information. The grace period extension would eliminate extra shop visits for only drum replacement.

We do not agree. The cyclic intervals listed in the service information, based on piece-part inspection, apply to the threshold for performing the next USI. The compliance time for completing the terminating actions is not related to when or what inspections were performed. We did not change the AD.

## **Conclusion**

We reviewed the relevant data, considered the comments received, and determined that air safety and the public interest require adopting this AD with the changes described previously. We have determined that these minor changes:

- Are consistent with the intent that was proposed in the NPRM (79 FR 77411, December 24, 2014) for correcting the unsafe condition; and
- Do not add any additional burden upon the public than was already proposed in the NPRM (79 FR 77411, December 24, 2014).

We also determined that these changes will not increase the economic burden on any operator or increase the scope of this AD.

## **Related Service Information under 1 CFR Part 51**

International Aero Engines Alert NMSB No. V2500-ENG-72-A0615, Revision 6, dated September 4, 2014. The NMSB describes procedures for inspecting the engine front support pins. This service information is reasonably available because the interested parties have access to it through their normal course of business or by the means identified in the ADDRESSES section of this AD.

## **Costs of Compliance**

We estimate that this AD will affect 956 engines installed on airplanes of U.S. registry. We estimate that it will take about 3 hours per engine to perform the USI and about 2 hours per engine to perform the FPI or ECI of the HPC stage 3 to 8 drum. We also estimate that removing silver residue from the HPC stage 3 to 8 drum will cost about \$2,600 per engine and a set of silver free nuts will cost about \$1,060 per engine. We estimate the pro-rated replacement cost to replace an HPC stage 3 to 8 drum to be \$52,014. Based on these figures, we estimate the cost of this AD on U.S. operators to be \$53,630,644.

### **Authority for this Rulemaking**

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. Subtitle I, Section 106, describes the authority of the FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of the Agency's authority.

We are issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701, "General requirements." Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

### **Regulatory Findings**

We have determined that this AD will not have federalism implications under Executive Order 13132. This AD will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

For the reasons discussed above, I certify that this AD:

- (1) Is not a "significant regulatory action" under Executive Order 12866,
- (2) Is not a "significant rule" under DOT Regulatory Policies and Procedures (44 FR 11034, February 26, 1979),
- (3) Will not affect intrastate aviation in Alaska to the extent that it justifies making a regulatory distinction, and
- (4) Will not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

## **List of Subjects in 14 CFR Part 39**

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

### **Adoption of the Amendment**

Accordingly, under the authority delegated to me by the Administrator, the FAA amends 14 CFR part 39 as follows:

### **PART 39 - AIRWORTHINESS DIRECTIVES**

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

#### **§ 39.13 [Amended]**

2. The FAA amends § 39.13 by removing Airworthiness Directive (AD) 2012-09-09, Amendment 39-17044 (77 FR 30371, May 23, 2012), and adding the following new AD:

**2015-10-04 International Aero Engines AG:** Amendment 39-18159 Docket No. FAA-2009-1100; Directorate Identifier 2009-NE-37-AD.

#### **(a) Effective Date**

This AD is effective [INSERT DATE 35 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

#### **(b) Affected ADs**

This AD replaces AD 2012-09-09, Amendment 39-17044 (77 FR 30371, May 23, 2012).

#### **(c) Applicability**

This AD applies to:

- (1) All International Aero Engines AG (IAE) V2500-A1 turbofan engines; and
- (2) All IAE V2525-D5 and V2528-D5 turbofan engines; and

(3) IAE V2522-A5, V2524-A5, V2527-A5, V2527E-A5, V2527M-A5, V2530-A5, and V2533-A5 turbofan engines with serial numbers (S/Ns) V10001 through V13190, and V15001 through V16728, excluding V16707.

**(d) Unsafe Condition**

This AD was prompted by the discovery that additional attachment nuts for certain high-pressure compressor (HPC) stage 3 to 8 drums cause the drum to corrode and crack. We are issuing this AD to prevent failure of the HPC stage 3 to 8 drum, which could result in uncontained drum failure, damage to the engine, and damage to the airplane.

**(e) Compliance**

Comply with this AD within the compliance times specified, unless already done. You may use the inspections listed in paragraph (h)(3) of this AD instead of an ultrasonic inspection (USI) for the initial inspection required by paragraphs (e)(1) through (e)(5). If cracks are found during any of the inspections required by this AD, remove the drum from service before further flight.

**(1) Initial USI of the HPC stage 3 to 8 drum – Group “A” and Group “B”:**

For IAE V2500-A1 turbofan engines with S/Ns listed in “Group A” or “Group B” in paragraph 1.E. in IAE Alert Non-Mandatory Service Bulletin (NMSB) No. V2500-ENG-72-A0615, Revision 6, dated September 4, 2014, perform an initial USI of the HPC stage 3 to 8 drum within 200 cycles of the drum accumulating 8,000 cycles or within 200 cycles from the effective date of this AD, whichever occurs later.

**(2) Initial USI of the HPC stage 3 to 8 drum – Group “C”:**

For IAE V2500-A5 turbofan engines with S/Ns listed in “Group C” in paragraph 1.E. in IAE Alert NMSB No. V2500-ENG-72-A0615, Revision 6, dated September 4, 2014, perform an initial USI of the HPC stage 3 to 8 drum within 200 cycles of the drum

accumulating 6,250 cycles or within 200 cycles from the effective date of this AD, whichever occurs later.

**(3) Initial USI of the HPC stage 3 to 8 drum – Group “D”:**

For IAE V2500-A5 turbofan engines with S/Ns listed in “Group D” in paragraph 1.E. in IAE Alert NMSB No. V2500-ENG-72-A0615, Revision 6, dated September 4, 2014, perform an initial USI of the HPC stage 3 to 8 drum within 200 cycles of the drum accumulating 3,750 cycles or within 200 cycles from the effective date of this AD, whichever occurs later.

**(4) Initial USI of the HPC stage 3 to 8 drum – Group “E”:**

For IAE V2500-A1, -A5, and -D5 turbofan engines not listed in “Group A,” “Group B,” “Group C,” or “Group D,” and with drum assembly part numbers (P/Ns) listed in “Group E” in paragraph 1.E. in IAE Alert NMSB No. V2500-ENG-72-A0615, Revision 6, dated September 4, 2014, perform an initial USI of the HPC stage 3 to 8 drum within 200 cycles of the drum accumulating 12,500 cycles or within 200 cycles from the effective date of this AD, whichever occurs later.

**(5) Initial USI of the HPC stage 3 to 8 drum – Group “F”:**

For IAE V2500-A1, -A5, and -D5 turbofan engines not listed in “Group A,” “Group B,” “Group C,” or “Group D,” and with drum assembly P/Ns listed in “Group F” in paragraph 1.E. in IAE Alert NMSB No. V2500-ENG-72-A0615, Revision 6, dated September 4, 2014, perform an initial USI of the HPC stage 3 to 8 drum within 200 cycles of the drum accumulating 9,000 cycles or within 200 cycles from the effective date of this AD, whichever occurs later.

**(f) Repetitive USIs of the HPC Stage 3 to 8 Drum**

(1) For engines included in “Group A,” “Group B,” “Group C,” “Group E,” or “Group F,” as defined in paragraph (e) of this AD, perform repetitive USIs of the HPC

stage 3 to 8 drum within every 750 cycles of the last USI after the initial inspection required by paragraph (e) of this AD.

(2) For engines included in “Group D,” as defined in paragraph (e) of this AD, perform repetitive USIs of the HPC stage 3 to 8 drum within every 500 cycles of the last USI after the initial inspection required by paragraph (e) of this AD.

(3) If you inspect the HPC stage 3 to 8 drum at piece-part exposure, you may delay the next USI as shown in the “Grace Periods Table” for each compliance group listed in paragraph 1.E. in IAE Alert NMSB No. V2500-ENG-72-A0615, Revision 6, dated September 4, 2014.

**(g) USI Procedure for the Inspection of the HPC Stage 3 to 8 Drum**

For the USI inspections required by this AD, do the following. Inspect the stage 8 disk of the HPC stage 3 to 8 drum on the outer diameter adjacent to the stage 7 to 8 electron beam weld land using ultrasonic probe manipulator assembly P/N IAE2R19865 for IAE V2500-A1 engines, P/N IAE2R19852 or IAE2R19879 for IAE V2500-A5 engines, and P/N IAE2R19874 for IAE V2500-D5 engines. Inspect the stage 8 disk of the HPC stage 3 to 8 drum on the inner diameter at the inner radius position using ultrasonic probe manipulator assembly P/N IAE2R19870 for IAE V2500-A1 engines, P/N IAE2R19859 or IAE2R19880 for IAE V2500-A5 engines, and P/N IAE2R19876 for IAE V2500-D5 engines. Inspect the full circumference of both the inner and outer diameters. If the entire circumference cannot be inspected, remove the drum from the engine before further flight.

(1) Calibrate the ultrasonic equipment using the following parameters and the acceptance criteria listed in paragraph 3.A.(1)(a) of IAE Alert NMSB No. V2500-ENG-72-A0615, Revision 6, dated September 4, 2014. Use working standard P/N IAE2R19854 for outer diameter inspection and working standard P/N IAE2R19860 for inner diameter inspection:

- (i) Set Frequency to 5 Mhz
- (ii) Set Rectify to Full Wave
- (iii) Set Pulser to Single Crystal
- (iv) Maximize the signal response to achieve 70 percent full screen height
- (v) Adjust the range control to position the target signal at 5.0 time base position based on ten division time base
- (vi) For outer diameter inspection, set Gate Position to 3.5 - 7.0 time base position based on ten division time base
- (vii) For inner diameter inspection, set Gate Position to 3.0 - 8.0 time base position based on ten division time base
- (2) Inspect the HPC stage 3 to 8 drum using the acceptance criteria listed in paragraph 3.A.(1)(a) of IAE Alert NMSB No. V2500-ENG-72-A0615, Revision 6, dated September 4, 2014
- (3) After completing the inspection of each feature, verify the calibration of the ultrasonic equipment. If the calibration is under sensitivity by more than 3db, then repeat the calibration and inspection of the feature.

#### **(h) Removal of Silver-Plated Nuts**

At the next piece-part exposure of the HPC stage 3 to 8 drum after the effective date of this AD, do the following before returning any HPC stage 3 to 8 drum to service:

- (1) Remove from service all silver-plated nuts (fully or partially-plated), P/Ns AS44862 or AS64367, that attach the HPC stage 3 to 8 drum to the HPC stage 9 to 12 drum.
  - (2) Clean the HPC stage 3 to 8 drum to remove the silver residue.
  - (3) Inspect the HPC stage 3 to 8 drum using at least one of the following methods:
    - (i) Fluorescent penetrant inspection (FPI) of the HPC stage 3 to 8 drum for cracks,
- or

- (ii) Eddy current inspection (ECI) of the HPC stage 3 to 8 drum for cracks.

**(i) Installation Prohibition**

After the effective date of this AD, do not install any silver-plated nuts, P/N AS44862 or AS64367, into any engine.

**(j) Mandatory Terminating Action**

Within 9,450 cycles after the effective date of this AD, but not later than December 31, 2025, install:

- (1) an HPC stage 3 to 8 drum that has never operated with silver-plated nuts (fully or partially plated) to attach the HPC stage 3 to 8 drum to the HPC stage 9 to 12 drum, with

- (2) silver-free nuts to attach the HPC stage 3 to 8 drum to the HPC stage 9 to 12 drum.

**(k) Definition**

For the purpose of this AD, “piece-part exposure” is removal of the HPC stage 3 to 8 drum from the engine, removal of all blades from the drum, and separation of the HPC stage 3 to 8 drum from the stage 9 to 12 drum.

**(l) Credit for Previous Actions**

If you performed an inspection of the HPC stage 3 to 8 drum before the effective date of this AD using one of the following IAE NMSBs, you met the initial inspection requirement of paragraph (e) of this AD:

- (i) IAE NMSB No. V2500-ENG-72-0608, Revision 3, dated September 20, 2011.

- (ii) IAE NMSB No. V2500-ENG-72-0615, Revision 3, dated September 20, 2011; IAE Alert NMSB No. V2500-ENG-72-0615, Revision 4, dated May 2, 2013; and IAE Alert NMSB No. V2500-ENG-72-0615, Revision 5, dated August 5, 2014.

- (iii) IAE NMSB No. V2500-ENG-72-0638, dated April 11, 2013.

**(m) Alternative Methods of Compliance (AMOCs)**

The Manager, Engine Certification Office, FAA, may approve AMOCs for this AD. Use the procedures found in 14 CFR 39.19 to make your request. You may email your request to: ANE-AD-AMOC@faa.gov.

**(n) Related Information**

(1) For more information about this AD, contact Martin Adler, Aerospace Engineer, Engine Certification Office, FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803; phone: 781-238-7157; fax: 781-238-7199; email: martin.adler@faa.gov.

(2) IAE NMSB No. V2500-ENG-72-0638, dated April 11, 2013; IAE NMSB No. V2500-ENG-72-0637, dated May 2, 2013; IAE NMSB No. V2500-ENG-72-0625, dated October 8, 2014; IAE EM Task 72-41-11-200-001; and IAE EM Task 72-41-11-110-001, which are not incorporated by reference in this AD, can be obtained from IAE, using the contact information in paragraph (o)(3) of this AD. IAE NMSB No. V2500-ENG-72-0638, dated April 11, 2013 provides guidance on performing the USI. IAE NMSB No. V2500-ENG-72-0637 and IAE EM Task 72-41-11-200-001 provide guidance on performing the FPI. Guidance on performing the ECI can be found in IAE NMSB No. V2500-ENG-72-0625. IAE Engine Manual Task 72-41-11-110-001 provides guidance on cleaning the HPC stage 3 to 8 drum.

**(o) Material Incorporated by Reference**

(1) The Director of the Federal Register approved the incorporation by reference (IBR) of the service information listed in this paragraph under 5 U.S.C. 552(a) and 1 CFR part 51.

(2) You must use this service information as applicable to do the actions required by this AD, unless the AD specifies otherwise.

(i) International Aero Engines Alert Non-Modification Service Bulletin No. V2500-ENG-72-A0615, Revision 6, dated September 4, 2014.

(ii) Reserved.

(3) For IAE service information identified in this AD, contact International Aero Engines AG, 400 Main Street, East Hartford, CT 06118; phone: 860-368-3700; fax: 860-368-4600; email: [iaeinfo@iae2500.com](mailto:iaeinfo@iae2500.com); Internet: <https://www.iaeworld.com>.

(4) You may view this service information at the FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA. For information on the availability of this material at the FAA, call 781-238-7125.

(5) You may view this service information at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: <http://www.archives.gov/federal-register/cfr/ibr-locations.html>.

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